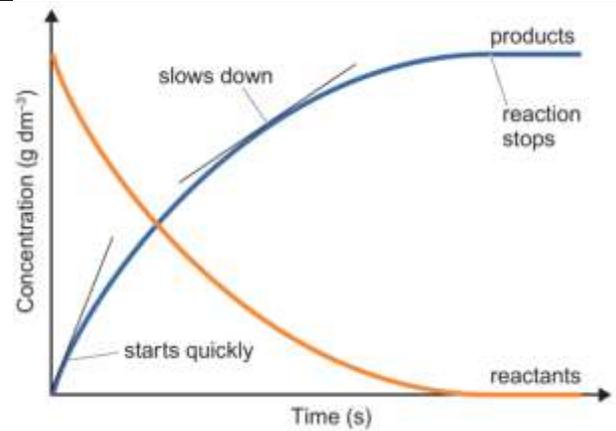
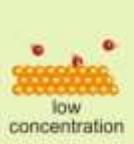
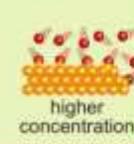
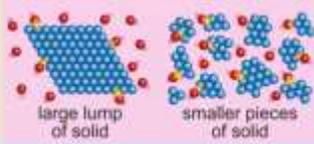
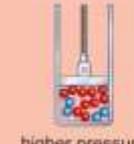
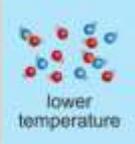
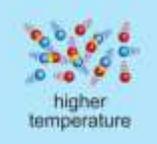
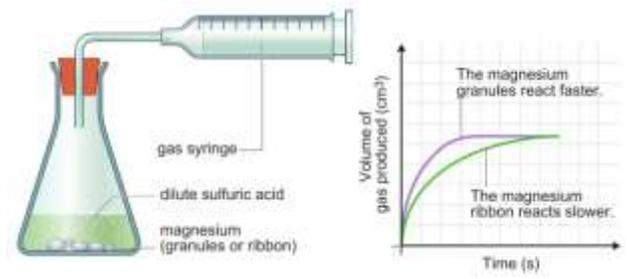


Chemistry – Rates of Reaction and Energy Changes (autumn term)

Section A: Vocabulary		Section B:	Section C:
product	A substance formed in a reaction.	<p>Rates of Reaction During chemical reactions, new substances are formed. The rate of the reaction is how quickly the reactants become the products. For a reaction to occur, we need the particles to collide and do so with enough energy. This minimum energy is called the activation energy.</p> <p>We can control the rate of reaction by altering different variables:</p> <ul style="list-style-type: none"> - Concentration of solutions. More particles in the same space, more frequent collisions - Surface area of solids. Greater surface area allows particles to collide more frequently - Pressure in gases. Increased pressure moves the particles closer to each, more frequent collisions. - Temperature. Increased temperature increases the kinetic energy store in particles so they move quicker (more likely to collide) and are more likely to have enough energy to collide successfully. <p>Investigating rate of reaction When a gas is produced in a reaction, we can record the volume collected over time or the change in mass of the reaction if the gas is allowed to escape.</p> <p><u>Effect of surface area on rate of reaction</u></p> <ol style="list-style-type: none"> A. Add volume of acid to a conical flask B. Add a set mass of marble chips to conical flask C. Place bung in conical flask and start timer D. Record total volume of gas that has been produced every 30s until there is no change E. Repeat investigation using larger/smaller marble chips 	<div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">  <p>low concentration</p> </div> <div style="text-align: center;">  <p>higher concentration</p> </div> <div style="text-align: center;">  <p>large lump of solid smaller pieces of solid</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">  <p>lower pressure</p> </div> <div style="text-align: center;">  <p>higher pressure</p> </div> <div style="text-align: center;">  <p>lower temperature</p> </div> <div style="text-align: center;">  <p>higher temperature</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  </div>
activation energy	The minimum amount of energy needed by colliding particles for a reaction to happen.		
active site	The space in an enzyme where the substrate fits during an enzyme-catalysed reaction.		
bond energy	Energy needed to break one mole of a specified covalent bond.		
catalyst	A substance that increases the rate of a reaction without itself being used up.		
denatured	An enzyme in which the shape of the active site has changed so much that its substrate no longer fits and the reaction can no longer happen.		
displacement reaction	A reaction where a more reactive element takes the place of a less reactive element in a compound.		
endothermic	A reaction in which energy is transferred to the reactants from the surroundings. The temperature of the surroundings decreases.		
enzyme	A protein produced by living organisms that acts as a catalyst to increase the rate of a reaction.		
exothermic	A type of reaction in which energy is transferred to the surroundings from the reactants. The products have less stored energy than the reactants have. The temperature of the surroundings increases		

mole	A mole of something is 6.02×10^{23} particles of it. The mass of a mole of a substance is the relative formula mass expressed in grams.
neutralisation	A reaction in which an acid reacts with an alkali or a base to produce a salt and water only.
precipitation	A reaction in which an insoluble product is formed from soluble reactants.
protein	A polymer made up of amino acids.
rate	How quickly something happens.
reactant	A substance used up in a chemical reaction.
reaction profile	A diagram to show how the energy stored in substances changes during a chemical reaction.
substrate	A substance that is changed during a reaction.

Catalysts

Catalysts can be added to reactions to increase the rate. They provide an alternative easier route for the reaction which lowers the activation energy. This can reduce temperatures needed and so save money.

Catalysts do not take part in the reaction so are reusable.

Enzymes are biological catalysts that fit one substrate which are sensitive to temperature and pH. If conditions are not correct, the enzyme is denatured.

Catalytic converters are used in vehicles to reduce the emission of more harmful gasses such as nitrogen oxides and carbon monoxide.

Energy changes in reaction

During chemical reactions, energy is taken in and given out by the substances when existing bonds are broken and new bonds are made.

We can show this on reaction profile diagrams and calculate the total energy change in a reaction

$$\text{energy change} = \text{energy in} - \text{energy out}$$

